

CLAIMS

1. A force feedback apparatus comprising:
jetting means that includes a nozzle and
5 that can control a jet amount or a jet direction of
gas or liquid jetted from the nozzle;
jet control means for controlling the jet
amount or the jet direction of the gas or the liquid
according to a position or an orientation of a
10 receiver that receives a pressure by the gas or the
liquid jetted from the jetting means so as to
provide force feedback to an operator, wherein the
position or the orientation of the receiver is
measured by receiver measurement means;
15 wherein, when the receiver has a concave
shape of a diameter D , intervals for placing the
nozzles in the jetting means are set such that at
least one nozzle exists within a region having a
diameter of a constant $\times D$.
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2. The force feedback apparatus as claimed
25 in claim 1, wherein the receiver has a hemispheric
shape and the constant is 0.8.

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3. A force feedback apparatus comprising:
jetting means that includes a nozzle and
that can control a jet amount or a jet direction of
gas or liquid jetted from the nozzle;
35 jet control means for controlling the jet
amount or the jet direction of the gas or the liquid
according to a position or an orientation of a

receiver that receives a pressure by the gas or the liquid jetted from the jetting means so as to provide force feedback to an operator, wherein the position or the orientation of the receiver is

5 measured by receiver measurement means;

wherein the nozzle includes nozzle open/close means for opening or closing in response to occurrence of a jet of the gas or the liquid, and wherein a point of support for opening and closing
10 of the nozzle open/close means is provided on the side of the operator.

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4. The force feedback apparatus as claimed in claim 1, wherein the nozzle includes nozzle open/close means for opening or closing in response to occurrence of a jet of the gas or the liquid, and
20 wherein a point of support for opening and closing of the nozzle open/close means is provided on the side of the operator.

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5. The force feedback apparatus as claimed in claim 1 or 3, further comprising virtual object calculation means for calculating a state of a
30 virtual object in a virtual environment, to be displayed by virtual environment display means, according to the position or the orientation of the receiver.

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6. The force feedback apparatus as claimed in claim 5, further comprising sound generation control means for controlling an attribute of a sound, to be generated by sound generation means, according to the state of the virtual object, or the position or the orientation of the receiver.

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7. The force feedback apparatus as claimed in claim 6, wherein the sound generation control means controls the attribute of the sound, to be generated by the sound generation means, according to the state of the virtual object, or the position or the orientation of the receiver, and according to identification of the receiver or a shape or a color of the receiver measured by the receiver measurement means.

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8. A force feedback method comprising a step of controlling a jet amount or a jet direction of gas or liquid according to a position or an orientation of a receiver that receives a pressure by the gas or the liquid jetted from a nozzle so as to provide force feedback to an operator,

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wherein, when the receiver has a concave shape of a diameter D , intervals for placing the nozzles in jetting means are set such that at least one nozzle exists within a region having a diameter of a constant $\times D$.

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9. The force feedback method as claimed in claim 8, wherein the receiver has a hemispheric shape and the constant is 0.8.

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10. The force feedback method as claimed in claim 8, further comprising a virtual object calculation step of calculating a state of a virtual object in a virtual environment, to be displayed by virtual environment display means, according to the position or the orientation of the receiver.

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11. The force feedback method as claimed in claim 10, further comprising a sound generation control step of controlling an attribute of a sound, to be generated by sound generation means, according to the state of the virtual object, or the position or the orientation of the receiver.

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12. The force feedback method as claimed in claim 11, the sound generation control step including a step of controlling the attribute of the sound, to be generated by the sound generation means, according to the state of the virtual object, or the position or the orientation of the receiver, and according to identification of the receiver or a shape or a color of the receiver.

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13. A force feedback program for causing a
5 computer to function as:

virtual object calculation means for
calculating a state of a virtual object in a virtual
environment, to be displayed by virtual environment
display means, according to a position or an
10 orientation of a receiver that receives a pressure
by gas or liquid jetted from a nozzle, wherein the
position or the orientation of the receiver is
measured by receiver measurement means;

jet control means for controlling a jet
15 amount or a jet direction of the gas or the liquid
according to the state of the virtual object, or the
position or the orientation of the receiver; and

sound generation control means for
controlling an attribute of a sound, to be generated
20 by sound generation means, according to the state of
the virtual object, or the position or the
orientation of the receiver.

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14. The force feedback program as claimed
in claim 13, wherein the sound generation control
means controls the attribute of the sound, to be
30 generated by the sound generation means, according
to the state of the virtual object, or the position
or the orientation of the receiver, and according to
identification of the receiver or a shape or a color
of the receiver measured by the receiver measurement
35 means.